

Qa) Transparencies
 (i) Example's Train against Tachyons.
 (ii) Energy, momentum of a tachyons

- (4) Reinterpretation Principle
Conventionality of Simultaneity
- (5) Conventionality of Simultaneity - contd

- (8) Transformations between Moving Reference Frames
(9) Accreted Synchronization

3. (11) Bizaro Pyramizatsiya conf.

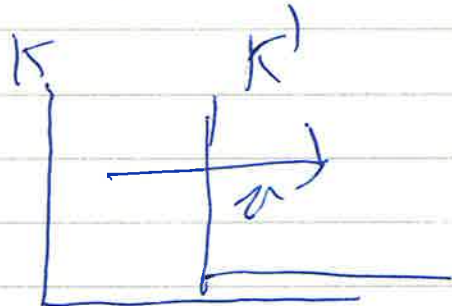
- (14) Tachyon Hybridization
(15) 1-dimensional lookups.

- 16) Braidings of particles.
- 17) Generalization of space-time continuity.

Homework

Invariance Principle (IP): All the laws of physics are unchanged or preserved under the Lorentz transformation

Fast Signal Source (FSS), left emits a fast (10. percent) signal



Lorentz

Galileo

$$x' = \gamma(x - vt)$$

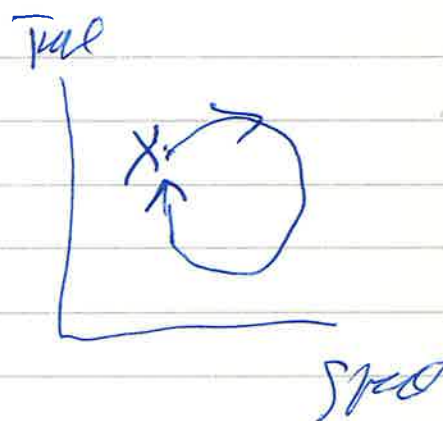
$$x' = x - vt$$

$$t' = \gamma(t - \frac{vx}{c^2})$$

$$t' = t$$

Causality paradox

Signal says: "Do not send the signal!"



Heisenberg - Minkowski - Bohr

$u > c$

$u = c$

$u < c$

(Lorentz)

(Galileo).

Ref. S. J. G. :
Wigner :
Zehner :
Mermin :

Opening remarks. A Trip on Einstein's Train

This paper is concerned with the question
if it is possible for a particle to travel
faster than light (consistently with S.R.)
Many philosophers believe this is not consistent
with S.R. but physicists for 20 years
have been producing a large literature on
the subject, experimental results have
been carried out successfully and even
by Salmann's Fall-Rain's Principle
nothing which is not predicted is
confuted.
The question is based up with the question
of defining simultaneity in S.R.
and in particular the relationship
of simultaneity. This was discussed by Einstein (1917)
in terms of his thought experiment of the train
which provides the simplest (following)
argument against Relativity.
If the light was speeded up to
the velocity of the particles used
disappear. To do this experiment would require
an infinite frequency. Here $1 \rightarrow 2$ S.R.

Heuristics: Relativity, Relativity, Relativity.

A Second Trip on Einstein's Train

- 1.) Introduction
- 2.) Tachyons
- 3.) Causal Theories of Multitasking
- 4.) Acoustic Relativity
- 5.) E-Acoustic Relativity
- 6.) Tachyon Synchronization
- 7.) Conclusions

* 1) can be expressed as follows
 $SR \rightarrow FSP$
 $T \rightarrow \neg FSP \rightarrow \neg SR$

2) can be expressed as follows
 $SR \wedge T \rightarrow \text{contradiction}$
 $\therefore T \rightarrow \neg SR$

In what sense does $SR \rightarrow FSP$
not in the same understood by
 Einstein

but in sense $PSR \rightarrow FSP$
 where PSR is philosophically grounded SR .
 This deduction is essentially via
 the P on PSR
 here we understand by SR essentially IP .

So there are really 3 arguments

1) $IP \rightarrow FSP$ Einstein
 $T \rightarrow \neg FSP \rightarrow \neg IP$

2) $IP \wedge T \rightarrow \text{contradiction}$ It is fallacious
Logical causal paradox
 $\therefore T \rightarrow \neg IP$

$IP \wedge T \wedge P \rightarrow \text{contra.}$
 2 questions In the line of
 certain properties of bodies or
 to what is their extent?

$\therefore T \rightarrow (\neg IP) \vee (\neg P)$

3) $PIP \rightarrow FSP$ quotation
 $T \rightarrow \neg FSP \rightarrow \neg PIP$

This is Leibniz's argument essentially.

A Second Trip on Einstein's Train

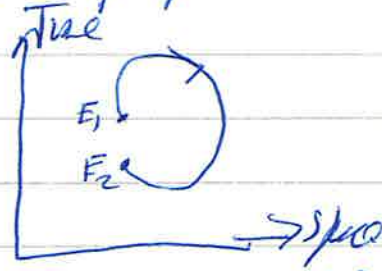
- ① Introduction Einstein train quotes. Show slide (1a)
- ② Tachyon = particles travelling faster than light (tachyon v. tardyon)

show (1a)

Tachyons claimed not to be possible:

- * 1) Contradicts S.R. 2) Causality paradoxes with properties of S.R.

Signal says "do not send this signal" of liar paradox.



Physicists think they are possible but with some unusual properties.
Philosophers think they are not possible at any rate consistently with S-R.

History: Luminous c.s.s.B.e

Pen.

Thomson (1889), Sommerfeld (1904)
 Arzelius (1955), Terletsky (1960), Tanaka (1962)
 Fokker et al. (1962) - new papers
 Feinberg (1967) 1st paper on tachyons
 Causality paradoxes: Trani, Polnick etc, d'Amato (1979)
 Document by Feynman (1965), Tolman (1917)
 Experimental search: Clay, Cronin (1974)

Thus 1.) E becomes ∞ $u \rightarrow c$ then imaginary
 Take imaginary rest mass.
 v.g. shows particles cannot accelerate
 from $u < c$ to $u > c$.

Show slides (1) and (2) and (2a)

② Note E and $(t_2 - t_1)$ change sign together under a Lorentz transformation
 Show slide (3)

Heur Reinterpretation Principle (RIP)
Show slide (4) (No serious difficulties about - no energies - instability of vacuum etc)

Suffered to take the Causality paradoxes (Feynman, Fermi)

- NB. 1) Bludman, Ruderman (1968) experimental violation of speed of light in ultra dense matter $w = \sqrt{1/\epsilon}$
2) Extended Relativity with superluminal phase (Parker (1969), Hoare (1970), Gold (1973))

No Gurnbaum arguments against tachyons

(3) Causality of simultaneity Show slide (5) and (5)
Formal definitions of betweenness and simultaneity.
Show slides (6) and (6a)

No Reichenbach ϵ -paradoxes
Show slide (7)

(4) Aberration Relativity Transformation between Moving reference frames
Derivation of $x' = \frac{1}{\gamma} (x - vt)$
 $t' = \frac{1}{c(1 - mv)} (t - mx)$
Show slides (8) and (8a)

(5) Aberration Relativity
Derivation $m = \gamma/w^2$
Show slide (9)

Acoustic Relativity from slide (10)

Newtonian world $x' = x - vt$
 $t' = \frac{1}{1 - v^2/c^2} (t - vx/c^2)$

Einsteinian world $x' = \frac{1}{\sqrt{1 - v^2/c^2}} (x - vt)$
 $t' = \frac{\sqrt{1 - v^2/c^2}}{1 - v^2/c^2} (t - vx/c^2)$

⑥ Definition of Litzare synchronization

Theorem. Einstein Convention for optical relativity is never Litzare

Theorem Acoustic Synchronization is Litzare for $v > (\frac{c}{\omega})\omega$.

from slide (11) and (11a)

⑦ E-Relativity

from slide (12)

⑧ Sjödin-Tongberg's Transponders

from slide (13)

There are thought to be Sjödin to connect to absolute synchrony established by Litzare signalling.

⑨ Apparent Power

Einstein Synchronization in π' is
because relative to Lorentz synchronization
in K .

But throughout Lorentz are available
both in $K > K'$. Here both can
maintain conflicting claims of simultaneity

Show slide (14)

⑩ Difficulty is due to the circumstance that simultaneity for Lorentz is not an absolute notion

Here with our previous point says
the Einstein consideration of simultaneity
is sustained

⑪ cp $(\square - \mu^2) \phi = 0$ wave
 $(\frac{1}{v^2} \frac{\partial^2}{\partial t^2} - \nabla^2) \phi = 0$

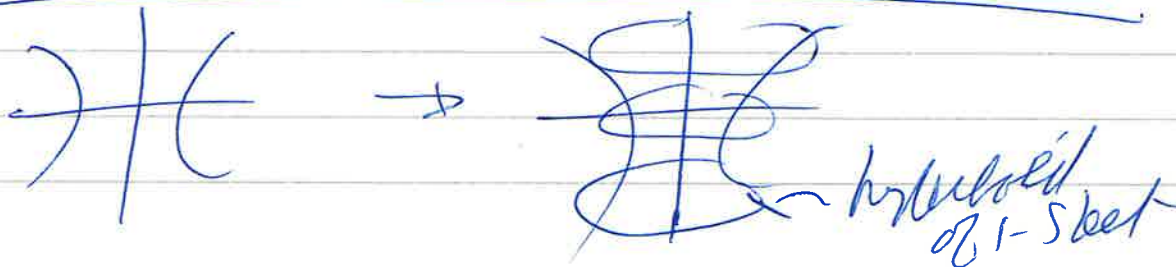
⑫ 1-dimensional Lorentz

Show slide (15)

Compare with bridge case

Show slide (16)

⑬ Why this does not hold in Moller's 1-dimension



* which in turn reports as essential
physical content of S.P. viz that
there is empirical way of
determining which response is better
than the other and reply.

Note approach of Redfield et al.
that may exist an absolute response
from a.u.v. that is similar to event
in all other planes is left and,
and the evidence of a pair
very recent in the collection of
different phenomena, but the
molecular relation to other plane
very not to uncoverable

Note here the turn of interest, relation
epistemologically, do not and relation
epistemologically knowable.

of interest to Everett - Minkowski theory
of a tachyon emitter which breaks
relativity (1907) invariance (1973)

(An Everett's (1970) Michelson left
barrier)

Conclusion

- (14) FPS surfaces is supported by the
invariance principle in causal
theory of time.
- (15) But we can criticize the causal
theory of time and regard the previous
principle as the foundation of the
theory of relativity (as do most physicists)

1.) Continuous fundamentally processes
of temporal relations.

State of (17)

2) In 1917 quantum is marked
anyway.

- (16) IP says There exists a method of
defining clock settings at any location
and that form of all physical laws
remains the same. *
- N.B. this does not require $\epsilon = 1/2$ clock,
but same ϵ in both frames.
and hence $\Rightarrow$ relativity of simultaneity.

(17) but $\epsilon = 1/2$ rules become obsolete
sufficient, they are not, equivalent.

So concluding remarks

- (18) Nothing in the theory of relativistic quantum field theory rules out tachyon interaction and indeed recent work on the EPR paradox (Box 1972) has suggested that etc
 observed non-local effects are mediated by a tachyon field
 But that is another story
 all to all together